Aug. 31, 1965 W. M. BOOTH 3,203,270

STEERING FOR MARINE CRAFT

Filed Jan. 30, 1961 2 Sheets-Sheet 1

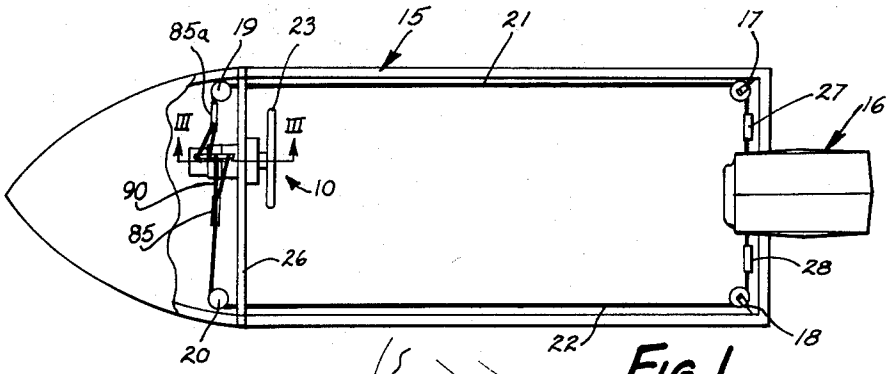


FIG. 1

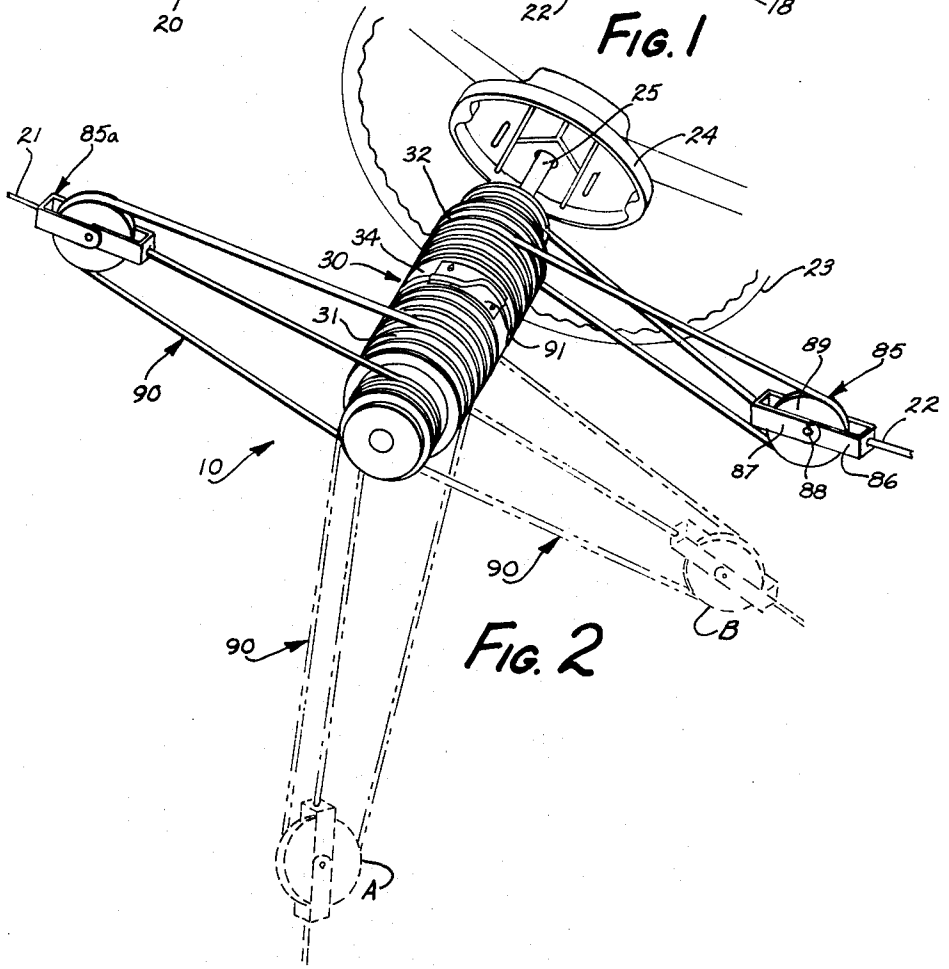


FIG. 2

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STEERING FOR MARINE CRAFT

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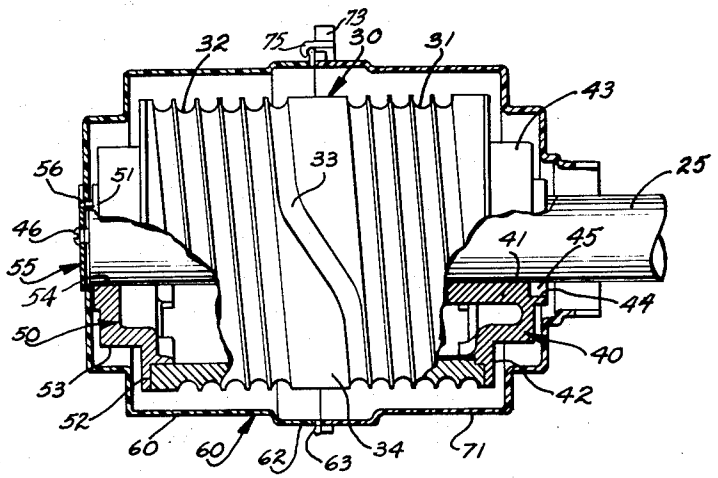


FIG. 3

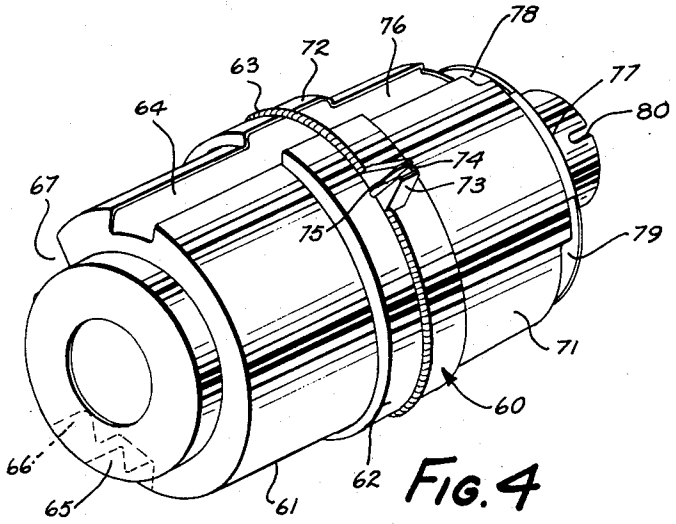


FIG. 4

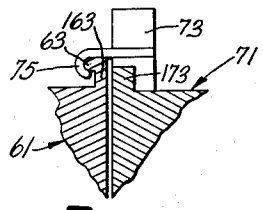


FIG. 5

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STEERING FOR MARINE CRAFT

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4 Claims. (Cl. 74—517)

This invention relates to marine steering mechanism, and more particularly to marine steering mechanism wherein the back pressure from the tiller or motor has no effect on the steering operation.

Present marine steering systems include a steering wheel shaft to which is secured a winding drum. Tiller cables are wrapped about the winding drum and pass through appropriate sheaves positioned along the boat to the stern of the boat where they are connected to the rudder, outboard motor, or other apparatus utilized for steering. One of the disadvantages of such a system is that the action of the motor or rudder is conveyed back to the steering wheel via the tiller cables. This is highly undesirable in many instances. One such instance is where the boat operator is accidentally thrown from the boat and the motor turns, causing the boat to travel in circles and run down the operator. The motor may also strike a dead head or some other object in the water and wrench the steering wheel from the operator's hand causing the boat to take an undesirable course resulting in an accident. Thus, it can be seen that present steering mechanisms are not altogether safe.

Another problem in the present steering mechanisms is that there is considerable lost motion in the steering action. This may be eliminated to a great extent by placing tensioning means in the tiller cables. However, since the mechanical advantage of present systems is low, increased tension on the cables results in an arrangement which is difficult to operate. This is particularly undesirable for the female boat operator.

Present steering systems require that the tiller cable tensioning means be placed in the stern of the boat. Present day boats also require that motor accessories such as the battery for the electrical starting system and the fuel tank be placed in the stern of the boat. Thus, space is at a premium in this area of the boat and present steering mechanisms tend to increase the congestion in this area. Another requirement of present steering systems for boats of the runabout class in particular, is that one tiller cable be run down one side of the boat and other tiller cable down the other side of the boat. This may be undesirable in various installations.

The present invention is designed to overcome the above difficulties and yet provide a steering mechanism which can be manufactured at approximately the same cost as existing systems. The system of this invention utilizes a winding drum which is secured to a steering wheel shaft in a conventional manner. However, the winding drum is equipped with braking surfaces disposed at opposite ends thereof. A pulley rope is wrapped about the winding drum and the ends thereof entrained over traveling pulleys placed intermediate the winding drum and the tiller cables. The ends of the pulley rope are also wrapped around the braking surfaces of the winding drum and tied to the traveling pulleys. The traveling pulleys are then fixed to the tiller cables which are connected to the rudder or motor. When the winding drum is rotated by the steering wheel the pulley rope is played off from the winding drum and the braking surfaces. However, when back pressure from the motor or tiller attempts to turn the winding drum, the pulley ropes bind on the braking surfaces to prevent the motor from affecting the steering mechanism. Since the motor or tiller can in no way affect the steering mechanism, the boat cannot inadvertently take an undesirable course. Therefore, the steering mechanism of this invention is extremely safe. The intermediate traveling pulleys provide a means whereby the wheel ratio is decreased and the mechanical advantage increased. This provides for a steering system which can be operated with much less effort than previous arrangement and may be tensioned to the extent necessary to eliminate lost motion without sacrificing turning ease. The tiller cables can be connected directly to the motor or tiller, thus providing more room in the stern of the boat.

It is therefore an object of this invention to provide marine steering mechanism wherein the back pressure from the motor or rudder cannot steer the boat.

Yet another object of this invention is to provide marine steering mechanism wherein the wheel ratio is decreased and the mechanical advantage increased.

Still another object of this invention is to provide a marine steering mechanism having means whereby both tiller cables may be placed on the same side of the boat or along the bottom of the boat.

Another object of this invention is to provide a marine steering mechanism which is a package unit facilitating installation of the steering mechanism in a boat.

Still another object of this invention is to provide marine steering mechanism wherein the tensioning mechanism can be placed at any point along the tiller cable.

Another object of this invention is to provide a marine steering device having a cowling covering the winding drum, the cowling being adjustable to facilitate leading the pulley rope from any point about the circumference of the winding drum.

Yet another object of this invention is to provide a marine steering device which consists of a minimum number of component parts and is therefore economical to manufacture and maintain.

These and other objects and advantages of this invention will become more apparent upon reading the specification in conjunction with the accompanying drawings.

In the drawings:

FIG. 1 is a plan view of the steering mechanism of this invention shown installed in a boat;

FIG. 2 is a perspective view showing the winding drum and traveling pulleys secured to a conventional steering wheel shaft;

FIG. 3 is a cross-sectional view taken along the section lines III—III of FIG. 1;

FIG. 4 is a perspective view of the winding drum cowling; and

FIG. 5 is a fragmentary cross-sectional view through one of the clamping means for the two piece cowling.

This invention relates basically to a marine steering mechanism having structure which prevents the back pressure of the motor from steering the boat. This steering mechanism includes a winding drum having braking surfaces formed at opposite ends thereof. The winding drum is fixed to a steering wheel shaft in a conventional manner. A pulley rope is wrapped about the winding drum and the ends thereof entrained over traveling pulleys. The pulley ropes are returned to the winding drum and wrapped around the braking surfaces formed thereon. The ends of the rope are then tied to the traveling pulleys. The traveling pulleys are also connected to the tiller cables which are connected to the rudder or motor. The pulley rope is so wound about the winding drum and brake surfaces that when the winding drum is turned by the steering wheel the pulley rope is freely paid-out from the winding drum and brake surfaces. Although the braking surfaces are of a smaller diameter than the winding drum per se, the pulley rope is paid-off evenly due to the movement of the traveling pulley relative thereto.

However, when back pressure from the motor or rudder is transferred through the tiller cables to the winding drum the portions of the pulley rope wrapped about the braking surfaces bind on the braking surfaces preventing movement of the winding drum. Since two strands of the pulley rope lead from each braking surface, back pressure from the tiller cables results in both strands being pulled simultaneously. This action is similar to wrapping a rope around a post and pulling on the ends which causes the wraps of the rope to be drawn down tightly on the post or bind. Thus, the back pressure from the motor is incapable of steering the boat. The connection of the pulley rope with the traveling pulleys results in a mechanical advantage and a reduced wheel ratio. There is no lost motion in the system since the tiller cables are connected directly with the motor. This arrangement also allows the tensioning means to be positioned at any point in the tiller cables. The winding drum is covered with a cowling which is formed in two pieces. The one piece is clamped to the other piece by quickly detachable spring clips. The one cowling piece can be adjusted with respect to the other to facilitate leading the pulley rope from the winding drum at any point about the circumference of the winding drum.

The steering mechanism assembly is designated generally as **10**. The steering assembly **10** includes a winding drum **30** which has shaft end caps **40** and **50**, a cowling **60**, a lock retainer **55**, double tie back pulleys **85** and **85***a* and pulley rope **90**. The steering mechanism assembly **10** is associated with a boat **15** and motor **16**. Tiller cables **21** and **22** are connected to the assembly **10** and the motor **16**.

Referring now more specifically to the details of the invention, FIG. 1 best illustrates the manner in which the assembly **10** is mounted in the boat **15** now to be described.

The boat **15** is a runabout of conventional design. Although the steering mechanism is shown associated with this type of boat, it is to be understood that within the broadest aspect of the invention the steering assembly **10** may be utilized with any boat of the outboard class and all of the smaller inboard craft. However, the steering assembly **10** is particularly desirable for use with outboards.

The motor **16** is of conventional outboard motor design and is connected to the stern of the boat in a conventional manner. The dashboard **26** of the boat is located in the usual position adjacent the bow of the boat. The dashboard **26** supports the steering wheel housing **24** which is secured thereto by a conventional fastening means.

The steering wheel shaft **25** is journaled in the housing **24** and projects through the dash **26**. The one end of the steering wheel shaft **25** is provided with a steering wheel **23** which is fixed thereto in a conventional manner. The other end of the steering wheel shaft **25** is provided with a winding drum **30** now to be described.

The winding drum **30** is an elongated sleevelike member. The outer periphery of the winding drum is provided with a front series of grooves **31** and a rear series of grooves **32**. The grooves **31** and **32** are separated by a driving land **34**. A cross-over groove **33** is provided between the grooves **31** and **32** for purposes which will be explained more fully hereinafter. There are six front grooves **31** and a similar number of back grooves **32**. This number has been found desirable for most installations; however, it is to be understood that within the broadest aspect of the invention this number may be increased or decreased as the situation demands.

Connected to one end of the winding drum **30** by conventional means (not shown) is a shaft end cap **40**. The shaft end cap **40** is a generally cup-shaped member having an inner flange wall **41** and an outer flange **42** which is both parallel and normal to the inner flange wall **41**. The parallel portion of the outer flange **42** is in the form of a braking surface **43** which is concentrically arranged about the inner flange wall **41**. The interior surface of the inner flange wall **41** engages the steering wheel shaft **35**. A transverse slot **44** is formed in the end cap **40** and receives a locking pin **45** which extends transversely through the shaft **25** and keys the end cap **40** and winding drum **30** to the steering wheel shaft **25**.

The bottom end cap **50** (FIG. 3) is fixed to the other end of the winding drum **30** by conventional key means (not shown). The bottom end cap **50** is also generally cup-shaped and has an outer flange **52** which is set inwardly and is transverse to the bottom end cap **50**. The flange **52** abuts the end of the winding drum **30**. A braking surface **53** is formed on the outer periphery of the bottom end cap **50**. The braking surface **53** is generally concentric to the steering wheel shaft **25**. The end of the bottom end cap **50** is provided with a bore **54** to receive the end of shaft **25**.

A cowling designated generally as **60** (FIG. 4) covers the winding drum **30**. The cowling **60** is a two-piece member having a bottom end **61**. The bottom end **61** is generally cylindrical in shape and has a raised boss **62**. The boss **62** has a turned up edge or lip **163** which extends transversely therefrom. The face of the lip is provided with a plurality of detents **63**. Detents **63** are positioned about the circumference of the cowling bottom end. The cowling also has a nose portion **65** which is a cylindrical member of reduced diameter. Portions of the cowling nose **65** are cut away to form pulley rope apertures **66** and **67** for purposes which will be explained more fully hereinafter. A pulley rope aperture **64** is also formed in the main portion of the cowling bottom end.

The cowling shaft end **71** is generally similar in configuration to the cowling bottom end **61**. It has a boss **72** which has an upturned transverse edge **173** that abuts the back side of the lip **163** in which the detents **63** are formed. In addition, the boss **72** has outwardly projecting ears **73** positioned at spaced intervals about the boss. The ears **73** have a centrally disposed slot **74** which receives a spring clip **75**. As shown in FIGS. 4 and 5, the one end of spring clip **75** engages one of the detents **63** and the other end is attached to the ear **73**. This arrangement provides a means whereby the bottom end cowling may be shifted in intervals about the entire circumference of the cowling. The shaft end cowling also has a pulley rope aperture **76** formed therein. A stepped cylindrical nose is formed on the end of the shaft end cowling **71**. The end of the nose is provided with notches **80** for purposes of aligning the cowling and fixing it against rotation. Portions of the nose **77** are cut away to form pulley rope apertures **78** and **79**.

A lock retainer **55** (FIG. 3) is secured in position by the fastener **46**. The lock retainer **55** has a key **56** which is formed therefrom and projects in a normal direction from the lock retainer. The key **56** engages in the keyway **51** formed in the bottom end cap **50**. The lock retainer **55** is of greater diameter than the opening formed in the cowling nose **65**. When the fastener **46** is secured in position, the lock retainer **55** prevents longitudinal movement of the cowling **60**.

The center of a pulley rope **90** is fixed to the cross over groove **33** of winding drum **30** by a pulley rope clamp **91**. The pulley rope clamp **91** is fixed to the land **34** by conventional screw fasteners. The pulley rope **90** is wound in opposite directions from the center around the forwardly directed grooves **31** and the rearwardly directed grooves **32**. The pulley rope is wrapped three turns in each direction from the divider land **30**. This is best shown in FIG. 2. The one end of the pulley rope **90** is then entrained about the pulley **85** now to be described.

The pulley **85** is a double tie pulley having U-shaped carriages **86** and **87** which are joined together in the middle by axle pin **88**. A grooved pulley wheel **89** is rotatably mounted on the axle pin **88**.

The pulley rope **90** after being trained over the pulley wheel **89** is returned to the winding drum and two turns wrapped about the braking surface **43**. The end of the rope is then tied to the carriage member **87**.

The other end of the pulley rope is entrained about a traveling pulley **85***a* which is identical to the traveling pulley **85** and therefore will not be explained in detail. The other end of the pulley rope **90** is then wrapped twice about the braking surface **53** of bottom end cap **50** and the end tied to the carriage of traveling pulley **85***a*. The strands of the pulley rope **90** which are wrapped about the braking surface **53** project from the pulley rope apertures **66** and **67** when cowling **60** surrounds the winding drum **30**. The strand which is wrapped about the grooves **32** passes through the pulley aperture **64**. The strands of the pulley rope **90** which are wrapped about the braking surface **43** pass through the apertures **78** and **79**, and the strand which is connected with the winding drum grooves **31** project through the aperture **76**.

A tiller cable **22** is connected to the carriage member **86** of traveling pulley **85** and a tiller cable **21** is connected to the corresponding carriage member of traveling pulley **85***a*. The tiller cable **22** passes around sheave **20** which is connected to the side of the boat **15** adjacent the dashboard **26**. The tiller cable **22** also passes around sheave **18** which is connected to the boat side adjacent the stern of the boat. The tiller cable **22** is connected to a tensioner **28** which is in turn connected directly to the motor **16**. The tiller cable **21** passes over a sheave **19** which is directly opposite the sheave **20** and a sheave **17** which is directly opposite the sheave **18** and is connected to a tensioner **27**. The tensioner **27** is in turn connected directly to the motor **16**.

Operation

The steering assembly **10** is installed in the boat as shown in FIG. 1. However, it is to be understood that the pulley **85***a* may be directed perpendicularly to the pulley **85** and the tiller cable **21** run along the bottom of the boat. The pulley **85***a* may also be rotated 180 degrees to the dotted line position shonw in FIG. 2 and both the tiller cables **21** and **22** placed on the same side of the boat.

The winding drum **30**, the pulley rope **90**, the traveling pulleys **85** and **85***a* and the cowling **60** are all factory assembled. Since the normal installation of the tiller ropes **21** and **22** are along opposite sides of the boat the bottom end cowling **61** is normally secured to the shaft and cowling **71** in a manner such that the pulley rope apertures **64**, **66** and **67** allow the strands of the pulley rope leading to the traveling pulley **85***a* to be opposite to strands of the pulley rope **90** leading to the traveling pulley **85**. Thus, if it is desirable to direct the strands of the pulley rope **90** leading to the traveling pulley **85** in a different direction it is necessary to change the position of the apertures in the bottom cowling end **61**. This is accomplished by releasing the spring clips **75** and rotating cowling bottom end **61** until the apertures **64**, **66**, **67** are in a position to allow the pulley rope strands to extend in the desired direction without intefering with the cowling. The spring clips **75** are then snapped into position fixing the cowling bottom end **61** with respect to the cowling shaft end **71**.

As best shown in FIG. 2, the strands of the pulley rope **90** will pay-off the winding drum **30** and the braking surfaces **43** and **53** when the winding drum is rotated by the steering wheel **23**. When the shaft **25** is rotated by the operator by turning the steering wheel **23**, rotation of the drum and braking surfaces causes the portion of the rope passing around the braking surface to slacken off the surface, thereby permitting slippage between the braking surface and the pulley rope. This is because the rope tends to move faster than the braking surface and creates this slack. Therefore, the steering shaft is readily operated by the steering wheel to maneuver the boat. The mechanical advantage of the arrangement causes the steering to be even simpler and nullifies the very slight frictional effect of the slipping braking surface against the slackened rope. However, if the motor **16** attempts to turn the turning pressure is conveyed through the tiller ropes **21** and **22** to the traveling pulleys **85** and **85***a*. Depending on which direction the motor attempts to turn, the strands wrapped around either the braking surface **43** or **53** will bind on the braking surface thus preventing rotation of the winding drum **30**. This positively prevents the motor or rudder from steering the boat. Thus, when the motor attempts to steer the boat the strands of the pulley rope wrapped about the braking surface instead of being played off the drum as when the drum is turned by the steering wheel, they are tightened onto the drum braking further turning of the drum. More specifically, if a force is applied to the pulley means **85***a* by the tiller cable tending to pull it to the left, a tension force is applied to the pulley rope around the larger diameter portion and to the ends of the rope portion around the braking surface since the rope wrapped around the braking surface is tied to the pulley carriage. The rope portion around the braking surface thus causes the rope to bind. Now if the drum is to rotate, the tied rope end will move only a fraction of the distance of the remaining rope portion due to its being tied to the pulley. The rope must therefore slip on the braking surface if the pulley is to be forcefully shifted. However, it cannot slip because it binds theron due to the force itself. Thus, no matter how large a force is applied to the pulley carriage, the rope will just bind tighter and tighter on the drum and the adjacent braking surface and will completely prevent any rotational movement whatever of the drum and shaft. The same holds true for a force tending to pull on the opposite pulley means.

It can be seen that the invention disclosed herein provides a steering stystem which prevents the motor from steering the boat. The boat steers easier due to the way the pulley rope is entwined about the winding drum and traveling pulleys. This arrangement provides a means whereby the boat may be turned from hard left to hard right with six rotations of the steering wheel. Due to the three strand connection of the pulley rope with the traveling pulleys a steering ratio and mechanical advantage of three to one is obtained. The winding drum, pulley ropes, traveling pulleys and cowling can all be factory assembled facilitating installation of the steering system in a boat. The cowling may be adjusted to facilitate leading the pulley rope from the winding drum at any point about the circumference of the winding drum. The steering system is extremely safe since the back pressure from the motor does not affect the steering of the boat. Since the tiller cables may be connected directly to the motor previous equipment necessary in the stern of the boat has been eliminated. Also, since the tiller cables may be connected directly between the steering assembly and the motor, tensioning means may be placed at any point in the tiller cables between the steering assembly and the motor eliminating lost motion.

While a preferred embodiment of this invention has been described, it will be understood that modifications and improvements may be made thereto. Such of these modifications and improvements as incorporate the principles of this invention are to be considered as included in the hereinafter appended claims unless these claims by their language expressly state otherwise.

I claim:

1. Marine steering mechanism comprising; a steering wheel shaft, a winding drum fixed to said shaft, said drum having a series of grooves divided by a land, cylindrical end caps secured to and extending from opposite ends of said winding drum and having peripheral braking surfaces of lesser diameter than said winding drum, a pair of pulleys, a pulley rope having the center thereof fixed

to said land and being wound around said series of grooves in opposite directions from the land, each end of the pulley rope being entrained about one of said pulleys and then wrapped about one of said braking surfaces, the ends of said ropes being returned to said pulleys and fixed to one end of the carriages of said pulleys, the other end of said pulley carriages being adapted to be tied to tiller cables.

2. Marine steering mechanism comprising; a steering wheelshaft, winding drum means fixed to said shaft, cylindrical braking surface means forming a part of said winding drum and of lesser diameter than the remainder of said drum, pulley means, pulley rope means wrapped about said winding drum and having the ends thereof entrained about pulley means, said ends also being wrapped about said braking surface means and then being tied to said pulley means, said pulley means adapted for being fixed to tiller cables for steering a boat, the association of said pulley rope means with said braking surface means preventing a force on the tiller from moving said winding drum.

3. Marine steering mechanism comprising; a steering wheel shaft, a steering wheel fixed to said shaft, winding drum means fixed to said shaft, cylindrical braking surface means formed at and extending from oposite ends of said winding drum and being of lesser diameter than the drum means, a pulley rope wrapped about said winding drum, pulley means including a first and second double tie pulley, one end of the pulley rope being entrained about said first pulley and the other end of the rope being entrained about said second pulley, the one end of said rope also being wrapped about one of said braking surfaces and tied to said first pulley, the other end of said pulley rope being wrapped about the other braking surface and tied to said second pulley, said first and second pulleys also adapted for being tied to tiller cables adapted to be attached to a motor, said pulley rope being paid-off from said winding drum when turned by said steering wheel, but being binding on said braking surfaces to prevent force applied to said motor from turning said steering wheel.

4. Marine steering mechanism comprising; a steering wheel shaft, a steering wheel fixed to said shaft, winding drum means fixed to said shaft, braking surface means formed at and extending from opposite ends of said winding drum and of lesser diameter than said drum means, a pulley rope wrapped about said winding drum, pulley means including a first and second double tie pulley, one end of the pulley rope being entrained about said first pulley and the other end of the rope being entrained about said second pulley, the one end of said rope also being wrapped about one of said braking surfaces and tied to said first pulley, the other end of said pulley rope being wrapped about the other braking surface and tied to said second pulley, said first and second pulleys also adapted for being tied to tiller cables adapted to be atttached to a motor, said pulley rope being paid-off from said winding drum when turned by said steering wheel but binding on said braking surfaces to prevent said motor from turning said steering wheel, and cowling means enclosing said winding drum means and including aperture means for passage of said pulley rope therethrough, a portion of said cowling means being adjustable with respect to the other portions to move said aperture means and thereby facilitate leading said pulley rope off from said winding drum at any point about the circumference thereof, and said first and second pulleys being movable about the circumference of said drum without hampering operation of said mechanism whereby said mechanism enables tiller cables to pass along the same sides or different sides of a boat as desired.

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